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National Soil Dynamics Lab

Conservation Systems Research

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Contact us:

USDA-ARS-NSDL
411 S. Donahue Dr.
Auburn, AL 36832
334-844-4741 x179

http://msa.ars.usda.gov/al/auburn/nsdl/csr

"The Tillage Lab" USDA ARS NSDL Conservation Systems Research Unit

Conservation Systems Research

RESEARCH PROJECT DESCRIPTION No. 4b

Tillage Requirements for Winter-Annual Grazing Rotations (Vegetables)

Cowpeas, watermelon, and sweet corn in rotation with winter grazing

Researchers
D.W. Reeves (Research Agronomist), R.L. Raper (Agricultural Engineer), G.G. Gordon (Graduate Student, Auburn University), J.M. Kemble (Auburn University), and R.A. Dawkins (AAES, Sand Mountain Research and Extension Center)

The Challenge
Two-thirds of farms in the USDA *Southern Region* include livestock operations, with beef the most common. A profitable option for Alabama farmers is to double-crop high-value vegetables with winter-grazing of beef cattle. Recent research in Alabama found that contract grazing of stocker cattle for 100 to 140 days returned $70 to $225 per acre. However, grazing results in soil compaction which can severely limit vegetable yields. In fact, cattle typically produce greater compaction force than tractors.

Our objective is to develop practical conservation tillage systems for integrating vegetable crop rotations with winter-annual grazing of stocker cattle, that improve or maintain soil quality and increase profitability:

- How do tillage systems affect soil properties after winter grazing?
- How much compaction is caused by grazing cattle?
- What are the best tillage systems for sweet corn, southern pea, and watermelon following winter grazing.?

"... crops vary in their response to tillage. Sweet corn may be especially sensitive to no-tillage following grazing... Strip tillage (in-row subsoiling, only) may be a workable ... system for watermelon."

The Experiment

At Sand Mountain Research and Extension Center in Crossville, AL, we began a three-year study in November, 2000. We are studying three vegetable crops, three surface tillage methods (disk, chisel, and no-till), and three sub-surface tillage methods (in-row subsoiling, paratill, and no-till) . All treatment combinations are also planted with ryegrass and grazed during the winter.

We are measuring:

- **Soil**: Bulk density, water infiltration, plant nutrients;
- **Plants**: Yield, nutrient content, leaf temperature;
- **Cattle**: Performance (weight gain)
- **Economics**: Production costs, returns.

What We Have Learned

After the first year (2001) of the three-year experiment, we can report preliminary results:

Southern pea yields differed by surface tillage methods. Chiseling produced the highest yields; no-till the lowest (disking was intermediate).

Sweet corn yields were higher with disk and chisel tillage, lower with no-till.

Watermelon yields were greater in disked fields compared to chiseled fields. In no-till fields, watermelon yields were greater when sub-soiled.

Our preliminary results suggest that these crops vary in their response to tillage. Sweet corn may be especially sensitive to no-tillage following grazing. Strip-tillage (in-row sub-soiling, only) may be a workable conservation tillage system for watermelon. This is the first year of a 3-year study, so our final conclusions may differ from these.

Winter grazing rotation with vegetables

Related Publications

Tillage Requirements for Winter-Annual Grazing Rotations (Cotton and Peanuts). Research Project Description No. 4b.